Tuberculin screening of some selected Fulani lactating cows in north-central Nigeria.

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Abstract

The prevalence of mycobacterial infection among lactating Fulani cows was investigated in the Federal Capital Territory (FCT), Abuja and Kaduna State of Nigeria. Tuberculin testing using single comparative intradermal tuberculin test (SCITT) showed a 14.6% positive, 4% doubtful and 81.4% negative reactors. Mycobacterial infection was found to be present in the nomadic (constantly moving) and semi-nomadic (limited movement) management systems studied but management showed no significant effect on the prevalence of the disease. However, the prevalence was significantly higher in older age groups than the younger ones ($P<0.05$).

Keywords: Fulani; Pastoral systems; Bovine tuberculosis; Mycobacterial infection; Lactating cows; Tuberculin test

1. Introduction

The re-emergence of tuberculosis (TB) has been observed in both developing and developed countries in recent years. Tuberculosis is responsible for 2 to 3 million human deaths annually and also causes great economic loss in the animal industry (Jalava et al. 2007). In cattle the disease is caused mainly by *Mycobacterium bovis (M. bovis)*. Nearly 85% of cattle and 82% of the human population in Africa live in areas where the disease is prevalent or only partially controlled (Ayele et al. 2004).

Though developed countries have adopted many strategies to detect and control bovine tuberculosis, most of these strategies are not transferable to developing countries, especially countries in sub-Saharan Africa like Nigeria, mostly due to political, social and economic reasons. For instance, the traditional 'test and slaughter' approach to control bovine tuberculosis is economically not viable and socially unacceptable by the herdsmen in many African countries (Ayele et al. 2004).

Nigeria with a population of over 120 million people and cattle population of about 20 million has been ranked 4th among the world's countries with a high TB burden (Abubakar et al. 2008). Few of the studies conducted in Nigeria have also shown that bovine tuberculosis is prevalent in most parts of the country and an increase in prevalence over the years has been observed (Cadmus et al. 2004, 2007). This study was designed to determine the prevalence of infection among lactating Fulani cows, which are the main source of milk and milk products to the public.

2. Materials and Methods

The study was carried out in the Federal Capital Territory (FCT) and Kaduna State of Nigeria. Abuja is the new capital city of Nigeria and has witnessed a high influx of

people and animals from all states of the federation. The predominant breed of cattle found in the study area is mainly the Zebu, which constitutes about 90% of the total national herd. Animals sampled in the study received little or no veterinary attention, were not usually supplemented and were owned mainly by the Fulani pastoralists. They were kept on a free-range grazing system either constantly moving (nomadic) or with limited movement (semi-nomadic), and using communal grazing grounds and watering points. Only lactating cows grouped into four age groups (2-3yrs, 3-4yrs, 4-5yrs and >5yrs) whose milk was meant for human consumption were included in the study. Herds were randomly selected from all the area councils or local governments of the FCT and Kaduna State respectively. Animals were sampled from both the nomadic and the semi-nomadic systems and cows were identified by their names and/or colour markings. A total of 967 cows from 57 herds were tested with 676 and 291 cows from the nomadic and the semi-nomadic pastoral systems respectively. Sensitization/advocacy system was used through the cattle rearers'association (Miyetti Allah Cattle Rearers Association) and members consented to participate in the study.

Epidemiological data was also collected from each animal sampled, as well as the herd owner, in the form of questionnaires to help to investigate and determine risk factors.

Tuberculin testing was conducted using purified protein derivative (PPD) obtained from the Veterinary Laboratory Agency (VLA) UK, to screen cows for tuberculosis using the single intra-dermal comparative tuberculin test (SICTT) (Shirima 2003).

The data in this study are non parametric categorical. In order to compare classes of this sort of data, chi-square test ($\chi 2$) test of significance with their appropriate degrees of freedom (df) was adopted, assuming a null hypothesis to calculate the expected values. The calculated chi-square was compared with the tabulated chi-square values to specify the level of significance or association. Comparison between observed and expected values was used

to reflect on any association or discrepancy. All statistical analysis was carried according to Bland (2003).

3. Results and Discussion

A total of 57 herdsmen whose herds were part of this study were interviewed by way of questionnaire and the data obtained showed that all of them have been herding for over 10 years. Forty six (80.7%) out of the 57 herdsmen did not boil their milk before selling it to the public, while all herdsmen and their families consumed the milk from their cows as a staple food. Over 90% of the herders claimed that they were able to recognize an animal with tuberculosis out of which 93% of them reported that they sold milk from these TB suspected cows. Of the 967 lactating cows tested from 57 herds from the nomadic and semi-nomadic pastoral systems, 20 cows were recorded as missed due to inability to take a reading 72hrs after testing. Out of the remaining 947 cows, 139 (14.6%) tested positive, 37 (4%) were inconclusive while 771 (81.4%) were negative reactors. The 14.6% tuberculin reactor rate observed among lactating cows especially in a society where milk and milk products are consumed unpasteurized as a local delicacy (‘Fura da nono’ and ‘man shanu’) is of great epidemiological and public health significance. This is exemplified by the life of the Fulani herdsmen, who live their entire lives with their animals and also consume their unpasteurized milk as staple food. This offers ample opportunity for zoonotic transmission of infection. There is also a risk for those working and/or living on farms with infected cattle. *M. bovis* infection has been recognized as potential occupational risk for farm and abattoir workers (Ayele et al. 2004).

The results of tuberculin tests obtained in this study (14.6% positive) are similar to that recorded in studies conducted in other parts of the country (Cadmus et al. 2004), but are

slightly higher than the prevalence recorded in similar studies (Cadmus et al. 2010, Ibrahim et al. 2010 and Okaiyeto et al 2008). The differences could be due to the fact that we only included female lactating cows in our study and it could also be due to the size of the herd. It has been shown previously that as the herd size increased there was increased risk of cattle reacting positively (Ameni and Erhikun 2005). However, our study and the other studies indicate that mycobacterial infection is prevalent in all parts of Nigeria, which might be attributed to management practices such as migration of nomads between the northern and southern regions of the country in search of greener pasture during the dry and raining seasons and the presence of mycobacterial infections in the environment. It could also be as a result of indiscriminate introduction of animals of unknown health status into herds.

Of the 663cows in the nomadic system, 104 (15.7%) were positive, 26 (4%) were inconclusive while 533(80.3%) were negative reactors. Of the 284 cows tested from the semi-nomadic system, 35 (12.3%) were positive, 11 (3.9%) were inconclusive/doubtful reactors while 238 (83.8%) were negative reactors. The prevalence of infection in the two management systems reflected no significant effect ($P>0.05$).

In order to establish whether there was an age effect, the chi-square test of significance with 6 degrees of freedom was used to compare the prevalence of the disease among the four different age groups. The chi-square with 6 degrees of freedom was 13.78 giving a probability level of significance of less than 0.05. The number of positive reactors (7 and 27 respectively) observed for age group 2-3 and 3-4 yrs was less than the expected value of 12.18 and 36.99 using chi-square test while that of the >5 years old was higher than the expected value (51.96), which could be due to chronic nature of the disease and the fact that adult animals are more at risk of getting infected (Table 1).

This study has shown a statistically significant effect of age on the prevalence of

mycobacterial infection in cows as reflected by PPD. Infection was found to be more prevalent among cows of older age (>5years) where over 19% prevalence rate was observed. Faye et al (2005) reported high tuberculin positive reactors among cattle of older age group. This finding has both epidemiological and public health importance because Fulani herdsmen normally sell old less productive cows to other livestock owners for fattening and subsequent slaughter. The implication of this is the spread of the disease to other herds both at the cattle market and on introduction into new herds. If sold for slaughter in abattoirs or private slaughter, the risk of transmission to meat handlers is possible, especially where butchers and meat inspectors process and inspect meat, offal and meat products with bare hands and minimal protective clothing.

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Table 1**:** Chi-Square table of comparison of the prevalence of Mycobacterial infection among different age groups based on tuberculin test in the Federal Capital Territory and Kaduna State of Nigeria (2004-2005)

Age (Years)		No Positive	No. Inconclusive	No. Negative	Total
2-3	O:	7	5	71	83
	E:	12.18	3.24	67.57	
3-4	O:	27	8	217	252
	E:	36.99	9.85	205.17	
4-5	O:	36	10	212	258
	E:	37.87	10.08	210.05	
>5	O:	69	14	271	354
	E:	51.96	13.83	288.21	
Total		139	37	771	947

O: Observed values, E: Expected values

$\chi 2$ with 6 df = 13.78, $P<0.05$